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EARS I PLANKTON ANALYSIS.(U)
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U. S. NAVY UNDERWATER SOUND LABORATORY
FORT TRUMBULL, NEW LONDON, CONNECTICUT

EARS I PLANKTON ANALYSIS.

by

C. L. Brown, Jr.

USL Problem No.
8-1-400-03-00

USL Technical Memorandum No. 2213-177-67

8 Sep 1967

INTRODUCTION

This is the fifth of a series of memoranda dealing with the results of EARS cruise I (28 October - 13 December 1966). One of the major objectives of the EARS cruise was the investigation of volume reverberation over a large geographical area. Geographical locations of stations can be found in USL Tech Memo 2211-58-67. In the study of volume reverberation, both acoustical measurements were made and biological samples taken at each station. In addition, other oceanographic parameters such as temperature, bathymetry, optical transparency, and sound velocity were also measured. The biological data are reported here.

METHODS

Samples of zooplankton were taken in the Deep Scattering Layers (DSL) using two different types of nets; open mouthed, 1 meter diameter net, and a Clark-Bumpus (C-B), opening-closing net, mouth diameter 0.3 meters. Further samples were collected in three different ways: (1) towing the 1 m net horizontally, (2) hauling the 1 m net vertically, and (3) hauling the C-B net vertically. Since many of the organisms comprising the DSL are active swimmers, the 0.3 C-B net is too small to take an adequate sample of all but the small, slow moving animals. In addition, a vertical tow filters much less water than a horizontal tow, hence inadequate water volumes are sampled. Therefore, it is advisable to compare only the results from the 1 m net towed horizontally. All samples were preserved in a 10% neutral formalin sea water solution.

Where such existed, the DSL was recorded at 12KHz on a precision depth recorder. The occurrence and behavior of the DSL during the cruise is reported in USL Technical Memorandum No. 2211-106-67. A036 514

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2213-177-67

RESULTS

Table 1 summarizes the results of the plankton analysis and indicates if organisms known to scatter were present and if scattering layers were recorded. In all, eleven samples from six stations were analysed. Only seven of these collections, that is those made with the 1 m net towed horizontally, can be compared.

Total number of organisms captured ranged from 2.8 - 275/m³. The high numbers found at station 6 (Grand Banks) and 7 (Gulf of Maine) were due to a bloom of copepods not unusual to that area. Copepods constituted the bulk of animals in all samples. At only two stations (1 and 3) were known scatterers caught.

Strong scattering layers were observed at stations 3, 4, and 5. No correlations were found between numbers of organisms and/or types and scattering level, with the possible exception of sample 6, station 3. Even though large animal densities were taken at station 6 and 7, no scattering layer was recorded with a precision graphic recorder at 12KHz.

At such time that reverberation co-efficients have been obtained from the acoustic records, correlations between biological populations and reverberation will be made at 1900 and 3800 Hz.

CONCLUSIONS

No correlations were found between the biological samples and the occurrence of scattering layers. With improvement in biological sampling methods and a greater knowledge of the acoustic properties of organisms, a better understanding of the DSL and its effects upon reverberation will be achieved. Nevertheless, in the study of volume reverberation, sampling biologically and acoustically gives improved insights into the problem than to sample only acoustically or biologically.

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TABLE 1

Plankton EARS I

| Station No. | 1 | 1 | 3 | 3 | 3 | 4 | 5 | 5 | 5 | 6 | 7 | 7 |
|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------|---------|---------|
| Sample No. | 1 | 3 | 5 | 5 | 6 | 4 | 12 | 13 | 15 | 16 | 19 | 20 |
| Position | | | | | | | | | | | | |
| North | 42 18 | 41 21 | 34 52 | 34 49 | 36 35 | 36 35 | 40 17 | 40 36 | 41 28 | 45 00 | 43 30 | 43' 30" |
| West | 11 50 | 11 09 | 10 05 | 10 27 | 21 00 | 21 00 | 32 47 | 32 49 | 35 19 | 51 00 | 62 00 | 67 00 |
| 1m net horizontal | | | | | | | | | | | | |
| Depth (meters) | 150 | 300 | 330 | | | 335 | | 300 | | 28 | 61 | |
| No. organisms/1000m ³ | 28150 | 2400 | 4600 | | | 12000 | | 81000 | | 250,000 | 275,000 | |
| 1m net vertical | | | | | | | | | | | | |
| Depth (meters) | | | | | | | | | | | | |
| No. organisms/1000m ³ | | | | | | | | | | | | |
| C-B 12" | | | | | | | | | | | | |
| Depth (meters) | | | | | | | | | | | | |
| No. organisms/1000m ³ | | | | | | | | | | | | |
| Scatterers Caught | yes | ? | ? | yes | ? | ? | no | ? | ? | no | no | ? |
| Fish/1000m ³ | 0.6 | | | 0.004 | | | | | | | | |
| Euphausiids/1000m ³ | 250.0 | | | | | | | | | | | |
| Pteropods/1000m ³ | 15.0 | 0.08 | 3600 | | | 400 | | | 300 | | | |
| Copepods/m ³ | 28000 | 2200 | 1000 | 4000 | 11000 | | 3700 | 81000 | 8800 | 250,000 | 275,000 | 87,000 |
| DSL Recorded | | | + | + | + | + | + | + | | | 0 | 0 |

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